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Gestão de Resíduos Sólidos: revisão sistemática de estudos qualitativos

Gabriel de Pinna Mendez[I], Claudio Fernando Mahler[II] e Stella Regina Taquette[III]

RESUMO

O presente trabalho tem por objetivo analisar estudos relacionados à gestão de resíduos sólidos desenvolvidos com métodos qualitativos. Para tanto, foi feita uma revisão sistemática da literatura publicada entre os anos de 2014 e 2019 nas bases de dados Scielo (Scientific Electronic Library Online), no Portal de Periódicos da CAPES e Web Of Science. Além da busca em periódicos de referência na área de resíduos (Waste Management e Waste Management and Research) por meio dos descritores "Pesquisa Qualitativa" e "Resíduos Sólidos" (Qualitative Research and Solid Waste); "Entrevista", "Resíduos Sólidos" e "Percepção" (Interviews, Solid Waste and Perception). Foram encontrados 598 artigos, sendo que após a aplicação de critérios de seleção descritos no presente artigo, o universo foi reduzido para um total de 42 publicações. Os artigos selecionados foram analisados e categorizados quanto aos aspectos mais relevantes como objetivos do trabalho, amostra utilizada no estudo e principais resultados. Verificou-se que a pesquisa qualitativa é adequada para responder questionamentos no campo de estudos sobre resíduos tais como, a relação entre os resíduos e os problemas de saúde pública, as dificuldades na coleta seletiva e nas demais ações de gerenciamento/tratamento, os impactos ambientais do descarte irregular de resíduos e os problemas na gestão de resíduos especiais.

Palavras-chave: Resíduos sólidos, Pesquisa qualitativa, Revisão da literatura

[I] CEFET – Federal Center for Technological Education Celso Suckow da Fonseca, Rio de Janeiro, Brazil - gabrielpmendez@gmail.com
[II] Federal University of Rio de Janeiro, Rio de Janeiro, Brazil - cfmahler@poli.ufrj.br
[III] Rio de Janeiro State University , Rio de Janeiro, Brazil - stella.taquette@gmail.com

1 INTRODUTION

1.1 Challenges in solid waste management

The problems related to the relationship between man and waste arose since the first civilizations. As soon as the human species, whose life model was of the hunter-gatherer type, started to create the first urban agglomerations and later the first cities, the generation of garbage became a cause for concern, due to problems related to public health and the environment. Around 2500 BC, in Mesopotamia, the Sumerians buried the debris they produced. Later, the residues were dug up and the decomposed organic matter was used as fertilizer, in the cultivation of cereals. In 500 BC, possibly the first garbage dump was created in Athens, Greece. In the 15th century, in the middle of the Middle Ages, the accumulated garbage contributed to the emergence of epidemics, such as the black plague, typhoid and cholera, which increased the death rate in the European continent (GRIPPI, 2006).

In the late 1830s, the waste treatment revolution began in London with the appointment of the Sanitation Commission, which established the first clear links between disease and poor sanitation conditions. It was at this time that the government's interest in public health spurred better solid waste management practices materializing in legislation, application and investment in infrastructure (MARSHALL & FARAHBAKHSH, 2013).

In 2014, Brazil had 5,570 municipalities and, according to Fernandes (2015), only 844 (15%) sent waste to supposedly sanitary landfills, 1,775 (32%) to dumps and, 2,951, 53%, did not even answer the survey. The average per capita generation of Solid Urban Waste (SUW) is 0.95 Kg/inhab/day (SNIS, 2017), and almost 200,000 Tons of waste are currently generated per day. While the more developed countries, increasingly, practically abolished the sending of waste to landfills, Brazil, like the other developing countries, seeks to build allegedly sanitary landfills and reduce the sending of waste to "dumps". Thus, in Brazil there are still at least 1091 dumps and 576 "controlled landfills", a name that has fallen into disuse (SNIS, 2017), that is, at least 1667 areas of irregular waste disposal.

The official data released by the National Sanitation Information System - SNIS (2016), SNIS (2017) and SNIS (2018) as well as the academic works of Ribeiro (2011), Fernandes (2015), Sousa et. al. (2016) and Mendez and Mahler (2018), show that the National Solid Waste Policy (Law 12,305 of 2010) has not generated, to date, significant improvements in solid waste management in Brazil. Although some interesting tools are mentioned, it left several sore points open, such as, for example, what is the sanction for mayors who do not manage waste in their cities in an environmentally appropriate way? What is inadequate environmental management? Who would set the parameters and scores? What would be "economically viable solutions"? Who would define this "viability"? Who is responsible for each phase in the so-called "shared responsibility for waste"? What is the deadline for sectoral agreements to take effect? Who is responsible for preparing, controlling, supervising and assisting recyclable waste pickers? If municipal consortia for waste management are not carried out, who will be responsible for carrying them out? In addition to these, many other gaps were left by the NWP approved in 2010.

In states like Rio de Janeiro, instruments provided for in the NWP, such as sectorial agreements and inter-municipal consortia for waste management, have not worked effectively (MENDEZ & MAHLER, 2018).

A trend in developed countries in waste management is the so-called circular economy, especially in the European Union (European Commission, 2015) and in China with the Law for the Promotion of the Circular Economy (Geissdoerfer et al., 2016), which seeks to boost the reuse and reduce disposal in landfills, in order to take full advantage of the resources explored and expand the useful life of products, seeking whenever possible to insert waste into the production chain (RAGAZZI et al., 2017; COBO et al. , 2018; MARGALLO et. Al, 2019).

Another important tool for improving solid waste management is selective collection. Currently, less than 40% (38.1%) of Brazilian Municipalities have a selective collection service, with the "door to door" modality being carried out in 37.8% (SNIS, 2018), being one of the most expensive ways selective waste collection, mainly when compared to the collection through Voluntary Delivery Stations - VDS, widely used in developed countries.

Even though the number of municipalities that have a selective collection initiative has increased considerably in the last two decades, the effectiveness is still low, considering that the percentage of recovery of Brazilian waste is insignificant, when compared to developed countries. While Europe recovers 45% of the waste generated, the USA 34% and Japan 19%, Brazil recovers only 1.4% (FADE, 2014).

With regard to the composting of organic waste, the data are also worrying, because only 1.8% of the waste collected in Brazil is taken to compost in the 70 Brazilian plants (SNIS, 2018). For a country where almost 40% of the municipalities declare to have a selective collection initiative, recovering only 2.2% and composting 1.8% of the collected waste is very little, even more so, when it is known that in the mass of household and public waste collected, approximately 50% is organic matter.

The issue of waste management is not only a technical engineering issue, but also involves political, economic, social, cultural, regulatory and environmental aspects. (GUERRERO et al., 2013). Being a problem of different dimensions, the search for different research methods in the area of solid waste, which until now, largely use quantitative methods, grows in importance. However, more recently, the qualitative method has proved to be an effective tool for understanding questions that do not have good answers only through numbers.

1.2 The Qualitative Method

The Qualitative Method has more than a century of existence and was initially proposed by researchers in the social/human sciences. However, over time it has been used in other areas, mainly in Health Sciences (PESSOA et al., 2017; TAQUETTE and BORGES, 2019).

At the end of the nineteenth century, in Heidelberg, Germany, and at the beginning of the twentieth century, in Chicago, United States, a school of sociology was born that radically rebelled against positivism, which assumed as true only what fit in the method to instead of privileging the capture of human reality (MINAYO; SANCHES, 1983; DEMO, 1998).

In the last decades, other areas of knowledge have used the qualitative method in research, for example, in medicine, education, administration, and even in engineering. The growing popularity of qualitative methods was accompanied by a diversification of research practices and according to Poupart et al. (2018), qualitative research is currently carried out in different institutional contexts and in the means most immediately associated with the intervention, with surprising complexity in the areas covered.

There is no consensus on the definition of Qualitative Research. Minayo and Costa (2019) state that qualitative research uses as raw material a set of nouns whose meanings complement each other: "experience, common sense and action. And the movement that informs any approach, is based on four verbs: to listen, to understand, to interpret and to dialect". These authors divide qualitative research into three stages of work: the first, exploratory, the second, fieldwork, and the third, the analysis of the material collected in an empirical and documentary way. Qualitative research works in a universe of values, beliefs, habits, attitudes, representations, opinions, specific to individuals or groups, being humanistic. The researcher perceives the scenario and people with a holistic view, separating their own beliefs, perspectives or predispositions. Therefore, it is used to understand phenomena that can be characterized by a high degree of complexity, as is the case with problems related to the treatment with solid waste.

1.3 Method

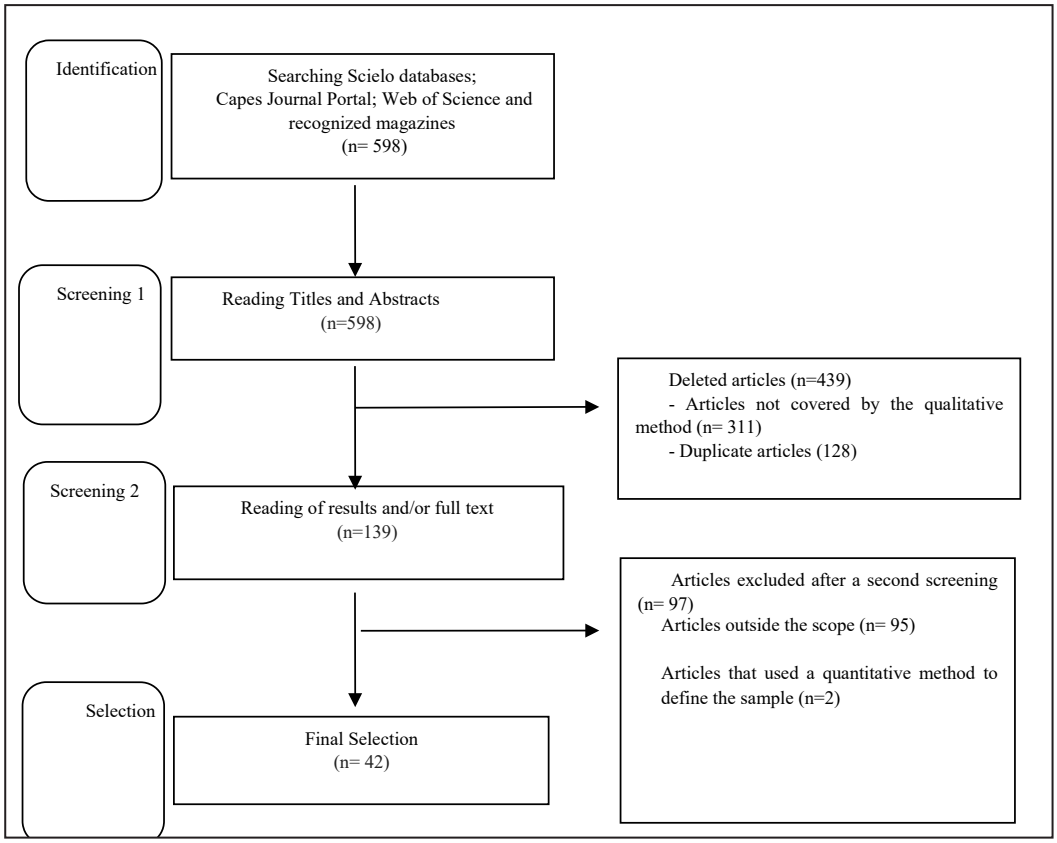
A review of articles published between the years 2014 and 2019 of studies on solid waste management developed with a qualitative method was carried out, according to the proposal of Okoli & Schabram (2010), called "stand-alone literature review". Its objective is to review the literature from eight different stages, which in summary form are: identification and objectives of the review, definition of the protocol and details of the search, inclusion and exclusion criteria and presentation of the results. The Scielo system (Scientific Electronic Library Online) the CAPES Journal Portal and the Web Of Science Portal were adopted as database. In addition to searching for articles through the aforementioned "Search Portals", journals (Waste Management and Waste Management and Research) were also searched.

The option to use the terms Interview, Solid Waste and Perception as keywords is based on the fact that many studies involving qualitative research do not make it clear that they used this methodology. However, the use of the term "perception" is widely noticed in qualitative studies and the interview is undoubtedly one of the most used research tools in the field of qualitative research.

From the search for keywords, a total of 598 articles were found, and after reading the titles and/or abstracts, 439 were excluded for not meeting the minimum requirements of the qualitative method (311) and the others (128) for being in duplicate, as described in Figure 1.

Part of the remaining 139 articles were read in full, in others only the results and conclusions were read in a second screening, which led to the exclusion of 97 more articles, 95 for not falling within the scope of the research and 2 for using a quantitative method, rather than qualitative. In the end, the selection universe was reduced to 42 articles. The bibliometric study on the subject was not the subject of the present study, since the systematic review of the literature carried out aimed, in addition to raising qualitative studies on the theme of solid waste, categorizing and analyzing them, however, some bibliometric data will be presented in due course.

Figure 1 - Flowchart for the Selection of Study Articles



Source: adapted from Taquette and Maia Monteiro (2019)

2 RESULTS AND DISCUSSION

According to the selection protocol described in Figure 1, 42 articles were selected whose theme falls within the scope of the research. As for the main categories of research problems addressed in the selected articles, it appears that a large part is related to selective collection, separation in the generating source and the work of waste pickers. Several articles presented as research topics some solid waste management instruments and practices such as reverse logistics, co-processing and recycling, in addition to the management of Health Service Waste.

Regarding the use of qualitative method tools, the most used were semi-structured interviews and questionnaires as shown in Chart 3. Three articles presented the use of software for qualitative data analysis, these being, respectively, the MAXQDA 10 software used by Babazadeh et al. (2018), VAPERCOM used by Tomasetto & Brandalise (2018) and N-VIVO, used in research by Demajorovic et al. (2016). However, it should be noted that in the case of questionnaires, qualitative research requires an analysis of the content of the responses to be made and not just tabulation and quantification of the data, under penalty of escaping the scope of the qualitative method.

Of the 42 selected articles, 27 had a number of respondents from 2 to 33. It can be said that the sampling criterion used in qualitative research is one of the most sensitive questions and that generates great discussions, especially when trying to analyze with parameters of quantitative studies, which require representative statistical sampling. It is important to highlight that the criterion for defining the sample in qualitative research is not taking the number of respondents as the main requirement, but the content of the material collected. According to Minayo (2017, p. 5) "in qualitative research, samples should not be thought of by quantity and need not be systematic". But its construction needs to involve a series of decisions not about how many individuals will be heard, but about the scope of social actors, the selection of participants and the conditions of that selection.

Regarding the main results found, it is clear that, in general, qualitative research was a tool that gave answers to the questions of the selected studies. As it deals with complex problems where there is interaction of different actors involved, the problems of waste management involve aspects that are not only technical, but also economic, social, environmental and referring to the subjectivity of human beings, so that qualitative research is indicated.

The selected articles were categorized according to the theme as follows: **category I** (studies dealing with the social actors involved in solid waste management); **category II** (studies dealing with solid waste management tools) and **category III** (studies on health issues related to solid waste).

Tables 1, 2 and 3 show the articles by categories, with authors, year and place of research, objectives, sample used and the main results and conclusions.

As for the collection of bibliometric data, figure 2 shows the number of publications selected from 2014 to 2019, and figure 3 shows the number of articles selected by region of study.

Figure 2 - Number of publications selected per year

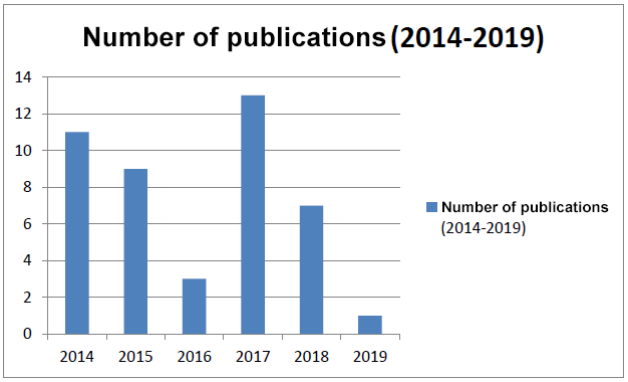
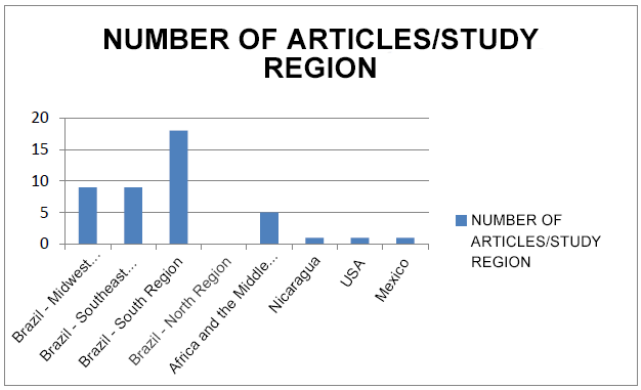


Figure 3 - Number of publications selected by study area



Regarding the number of publications per scientific journal, figure 4 shows that the national journal with the most selected articles was the "Revista de Gestão Ambiental e Sustentabilidade", with the magazine "Waste Management" being the international journal with the most selected publications.

Figure 4 - Number of publications selected by scientific journal

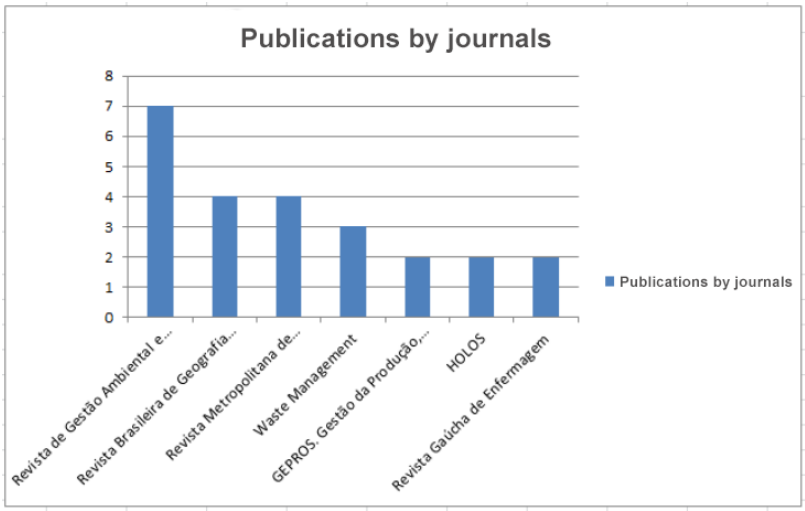


Table 1: Selected Articles in Category 1

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AUTHOR YEAR/PLACE	GOALS	SAMPLE	RESULTS / CONCLUSIONS
1. Ribeiro & Pereira (2014) Minas Gerais	Analyze the content of the discourse of the social actors involved in the management of solid waste in a municipality in Minas Gerais	48	It was found that no approach appeared in the relations in its pure form, presenting itself combined with each other. The existence of patrimonialist, bureaucratic, managerial, social and systemic approaches was verified in the relationships.
2. Rodrigues *et al*. (2014) Natal - RN	Show a critical analysis regarding the posture of society in the city of Natal/RN in the face of urban solid waste through the eyes of the street sweeper	25	Through the analysis of the answers obtained, it was noticed that the population of Natal, whether it be children, young people or adults, needs an environmental education to be worked on in order that the situation related to waste changes, thus improving the quality of the environment and life of people.
3. Moreschi *et al*. (2014) Rio Grande do Sul	Knowing the perception of teachers, students and graduates in the health field of two educational institutions	33	The main results showed that there is a perception focused on the importance of segregation and final destination of Health Services Residues and the lack of concern to reduce the production of these residues. There is a need to train qualified health professionals for the proper handling of this waste.
4. Rodrigues *et al*. (2015) Serra Talhada - PE	To verify the social and environmental benefits resulting from the implementation of the Solid Waste Recycling Cooperative in Serra Talhada/PE	2	The cooperative's main objective is still social, but it contributes to the preservation of the environment by reusing a quantity of material that would be wasted in the dump that, unfortunately, still exists in that municipality.
5. Feitosa *et al*. (2015) Iguatu - CE	Knowing the perception of waste pickers working in the municipality of Iguatu, CE, about the reality of work and the contribution of cooperative education	10	The importance of cooperative education was found to be the basis for the training and professional qualification of recyclable waste pickers. In addition, there was a need to strengthen the organization of waste pickers, through the formation of a cooperative, enabling progress in working conditions, life, income, product and market valuation.
6. Silva *et al*. (2015) Mossoró - RN	Investigate how the population of a rural settlement in Northeast Brazil deals with the issue of solid waste	54	The lack of collection and adequate treatment of waste generated in the settlement has caused environmental and public health problems
7. Ratnapradipa D. (2015) - USA	Check the population's perception of the main public health problems, including waste management	32	The results show a lack of information regarding waste management or information only regarding legal issues, which can lead to poor decision-making regarding environmental and public health issues.
8. Valente *et al*. (2016) – Pelotas - RS	Investigate the perception of the academic community of the Federal University of Pelotas about selective collection in the municipality of Pelotas	90	There is a need to implement a continuous, permanent and concise action in the different spheres of Pelotan society, covering all ages and classes so that the result of selective collection can be significant. The municipal power must communicate with the population at all stages of the management of household waste in the municipality.

Table 1: continuation

to be continued

AUTHOR YEAR/PLACE	GOALS	SAMPLE	RESULTS / CONCLUSIONS
9. Neves *et al*. (2017) – Santa Catarina	Knowing the profile of waste pickers and analyze the health risks to which they are subjected	39	The results indicate that actions for the social and economic development of waste pickers, as well as for the conservation of natural resources and health conditions of these populations, need to be implemented.
10. Coelho *et al*. (2017) – Rio Grande do Sul	Describe the elements that promote satisfaction and dissatisfaction in the work of recyclable material collectors	11	Four categories that illustrate experiences of satisfaction and dissatisfaction related to the identification with the tasks and with the content of the work, material and personal gains obtained with picking, prejudice, devaluation and difficulties in interpersonal relationships.
11. Bento *et al*. (2017) - Florianópolis	Identify the knowledge of nursing professionals in pediatric inpatient units about health service waste management	30	The results show that few professionals in the investigated institution are familiar with the Health Service Waste Management Program. Most perform care in relation to waste, but do not participate in training on the subject.
12. Mahler & Moura (2017) – Rio de Janeiro	Evaluate the functioning of a Hospital in terms of HSW through interviews with stakeholders, employees with key posts in the command structure and operating personnel	3	The results allowed us to conclude that the HSW management has some deficiencies which considerably increases the potential risk of waste from health services to the environment and public health. The present work is also an important contribution in the use of qualitative research to evaluate the process of managing HSW in health establishments, obtaining results similar to others of a qualitative nature.
13. Hartmann C. (2017) – Nicarágua	Investigate the social problems of waste pickers and economic conditions, including labor characteristics, family income and the incidence of poverty, after completion of the waste landfill project	191	The results indicate that hundreds of collectors were displaced by the project, benefits from the project's employment were unevenly distributed by neighborhood, and informal waste collection remains with persistent impoverishment, thus contributing to the continuous social, economic and environmental degradation
14. Borges *et al*. (2017) – Minas Gerais	Evaluate the knowledge and qualification of health professionals regarding the Health Services Waste Management Plan (HSWMP)	24	The results show that there is a great lack of knowledge on the part of HSWMP professionals. The study showed the need for training of members of the health team and the importance of the nurse's role as coordinator of this process.
15. Stumpf *et al*. (2018) – Rio Grande do Sul	Analyze how waste management occurs in four companies in the metal-mechanic segment	4	It was evident that companies that have environmental management systems have a better understanding of their environmental responsibilities, both with regard to the management of waste generated by the production process and the importance of raising employee awareness of the theme
16. Coelho *et al*. (2017) – Rio Grande do Sul	Describe the perception of recyclable material pickers about workloads in their daily work	11	Physical loads were associated with noise, exposure to chemical and biological waste, unpleasant thermal sensation, flooding, weight and repetitive movements. Psychic burdens were represented by concerns and emotional distress. The appreciation of the reality of the participants and the dialogue were fundamental to trigger the assistance action

Table 1: conclusion

AUTHOR YEAR/PLACE	GOALS	SAMPLE	RESULTS / CONCLUSIONS
17. Bandeira *et al*. (2019) – Rio Grande do Sul	Describe how medication is disposed of and assess the knowledge of professionals working in Units	16	Workers do not perform the correct disposal. Most are unaware of current legislation. Professionals identified contamination of the environment, misuse of medicines discarded incorrectly and bacterial resistance to drugs
18. Amate *et al*. (2017) Distrito Federal	Check the presence of health residues (HR) in the Estrutural dump, located in the Federal District (FD), 2013, through the reports of recyclable waste pickers who work in the dump.	11	It is concluded that the HR in the FD have an inadequate destination and the collectors constitute a group of vulnerable people who daily deal with this problem, in addition to the risks inherent to this activity.
19. Coelho *et al*. (2018) Santa Maria - RS	Describe the perception of recyclable material pickers about workloads in their daily work	11	Physical loads were associated with noise, exposure to chemical and biological waste, unpleasant thermal sensation, flooding, weight and repetitive movements. The appreciation of the reality of the participants and the dialogue were fundamental to trigger the assistance action.

Table 2: Selected Articles in Category 2

to be continued

AUTHOR YEAR/PLACE	GOALS	SAMPLE	RESULTS/CONCLUSIONS
1. Santos *et al*. (2014) Caicó-RN	Analyze the health service waste packaging - HSW	13	The basic health units in the municipality studied do not have a Health Service Waste Management Plan and there are problems with packaging and other phases of waste management
2. Heber & Silva (2014) Metropolitan Region of Aracaju - SE	Evaluate the institutionalization process of the National Waste Policy (NWP) based on one of its structuring elements: shared waste management	7	The results point to the existence of elements of the local context that restrict the implementation of national policy and suggest the importance of studies that accompany its implementation in other local realities in Brazil
3. Luna *et al*. (2014) Northeast Brazil	Analyze the reverse logistics process of containers from an alcoholic beverage manufacturer	12	In general, it was found that the beverage company has great challenges for the consolidation of the reverse logistics of containers. Based on the empirical observations of the study, it can be considered that the search for a better performance in relation to the return of products has been a feasible alternative for companies that seek to develop competitive differential in face of the competition
4. Ababio (2014) Accra - Republic of Ghana - Africa	Assess the conditions of the waste landfills in the city of Accra, capital of the Republic of Ghana, West Africa	44	The "sanitary" landfills in Accra are in a state of ambivalence due to poor management, design problems and the location of dumps, often close to water sources and human settlements have created aesthetic and odor disturbances and have increased health risks, attracting the discontent and distrust of the residents

Table 2: continuation

to be continued

AUTHOR YEAR/PLACE	GOALS	SAMPLE	RESULTS/CONCLUSIONS
5. Freitas & Nóbrega (2014) João Pessoa - PB	Analyze the main benefits of using tires in the co-processing of waste in the cement industry	21	The results obtained confirmed the benefits in co-processing, allowing the removal of 26,569 tons of waste tires that were deposited in the states of Paraíba, Pernambuco and Rio Grande do Norte, in addition to the creation of a collection mechanism by society, which enabled economic gains of the order of R $ 2 million to waste pickers, contributing to the improvement of their quality of life.
6. Altoé & Voese (2014) Paraná - Brazil	Evaluate the value creation process in the supply chain based on the sustainable management of residues from the biodiesel industry	Not found	The findings suggest that waste management enables the creation of value in the biodiesel supply chain. It is also noted that, based on this management, environmental preservation occurs, the incidence of fines is reduced or even eliminated and there is still economic cooperation between companies that have different activities, but make up the biodiesel supply chain.
7. Almeida Júnior *et al.* (2015) Santa Maria - Rio Grande do Sul	Check if the selective collection process used by the Municipality of Santa Maria/RS provides sustainability to participating waste pickers' associations	5	The selective waste collection process that the City Hall is adopting provides sustainability to associations and Santa Marienses, as it contributes to the environment and improves the population's quality of life
8. Domingos & Boeira (2015) Florianópolis - SC	Analyze the current scenario of household solid urban waste management in Florianópolis	5	It was observed that, despite serving more than 90% of the population, recycling is not very efficient, since recycling rates are low. In addition, there are few options for the treatment and final disposal of waste and the operational structure, according to the adopted theoretical framework, has deficiencies.
9. Demajorovic *et al*. (2016) São Paulo - SP	Discuss the main challenges and opportunities for implementing reverse logistics models for computers and mobile devices	21	The model presented threatens one of the most innovative points of Brazilian legislation, especially when thinking in the context of emerging countries, which refers to the inclusion of waste pickers' cooperatives in this process. RL programs in these countries can provide innovation, contributing not only to economic and environmental gains, but also to generate income and social inclusion
10. Netto *et al*. (2017) Angra dos Reis - RJ	Evaluate the evolution of the Selective Collection Program in the city of Angra dos Reis/RJ	8	It was found that popular participation in this municipality is not intense, requiring actions and incentives from the government in order to strengthen it. Selective collection needs greater dissemination, expanding the scope of the program.
11. Bispo *et al*. (2017) Natal – Rio Grande do Norte	Present the selective collection system in Natal / RN, as well as two recyclable material cooperatives in the city, in the years 2012 and 2013	70	The cooperatives have a precarious structure that directly affects the development of the activity and the quality of life of the collectors involved in the recycling chain.
12. Marques *et al*. (2017) Belo Horizonte - MG	Identify the challenges to the implementation and management of selective collection on the UFMG Pampulha Campus and its social impacts	22	There is a need for investments in infrastructure, the institutionalization of the process and the continuous promotion of environmental education campaigns, seeking the involvement of people in the program. It was considered important to establish associations of collectors of recyclable materials to enhance their activities.

Table 2: conclusion

AUTHOR YEAR/PLACE	GOALS	SAMPLE	RESULTS/CONCLUSIONS
13. Kuzma *et al*. (2017) Curitiba - PR	Evidence the costs of treatment and destination of solid waste and effluents generated by the activities of fuel resale stations, and the ways of treating these residues	2	The study points out that companies limit themselves to comply with the legislation for the management of waste and that the costs present a small average representation, in relation to the gross profit, confirming that it is possible and viable to adopt conscious practices of environmental management in small companies and comply with legal obligation.
14. Tomasetto & Brandalise (2018) Cascavel - PR	Identify and analyze the perception of customers of a flag industry in relation to the product life cycle	40	Consumers have an environmental perception and can become ecological consumers, in addition to showing concern with the stages of the product's life cycle from the production process to disposal.
15. Babazadeh *et al*. (2018) Tabriz - Iran	Identify the challenges in conducting a household waste separation plan (separation at source)	14	It is recommended that the main authorities linked to waste separation at source and recycling should update recycling plans and programs in addition to raising the importance of an integrated approach for the entire city
16. Caleffi & Barbosa (2018) Maringá - PR	Analyze the Waste Management of Electrical and Electronic Equipment - WEEE in the city of Maringá/PR	7	There was a low complexity of the WEEE Flow in the cooperative "Coopercanção", depending on the collaboration of citizens and companies for the collection of electronic waste. After the selection of these materials by the members of the cooperative, the material is sold to recycling industries.

Table 3: Selected Articles in Category 3

AUTHOR YEAR/PLACE	GOALS	SAMPLE	RESULTS/CONCLUSIONS
1. El-Wahab *et al*. (2014) Alexandria - Egypt	Analyze health problems related to workers in the public cleaning sector of the city of Alexandria in Egypt	346	All occupational risks must be identified and adequate protection against these risks must be provided. Actions should focus on improving and intensifying preventive measures to minimize bioaerosol levels in workstations, installing vacuum cleaning systems and closed conveyors
2. Fontana *et al.* (2015) Rio Grande do Sul	Identify health risks reported by workers working in the Landfill of Waste	24	Exposure to biological and chemical agents are the most frequent risks in the activity of these workers. It was found that the subjects are not assisted in their needs, and that self-care is neglected
3. Mahler *et al*. (2015) Paracambi - RJ	Assess the health conditions and quality of life of residents around the waste landfill, seeking to understand the relationship of residents with this area.	40	In the present study, it was found that residents perceive the dump as a cause of respiratory problems in children, corroborating the official epidemiological data of the municipality, that is, a greater presence of respiratory problems in the population when compared to other cities in the state of Rio de Janeiro.
4. Börner *et al*. (2015) San Luis Potosi - Mexico	Analyze Mexican adolescents' perceptions of environmental health risks in contaminated urban areas	74	Adolescents in both communities perceived a wide range of environmental health risks detrimental to their well-being, for example, waste, air pollution and poor hygiene.
5. Coelho *et al*. (2016) Rio Grande do Sul	Understand the risk of illness related to work and defensive strategies in women who collect recyclable material	Not found	The wear and tear arising from work can favor the illness of the waste pickers, as it compromises physical health, psychological integrity and social relationships. The collectors use individual and collective defensive strategies that aim to minimize the suffering related to work activity.
6. Chiariello C. L. (2018) Porto Mortinho - MS	Analyze the management of solid waste and its contribution to the collective health of the population near the dump in the municipality of Porto Murtinho - MS	10	It was concluded that the residents living near the municipal dump do not perceive a good waste management by the public power, as they report the lack of adequate infrastructure, unsanitary conditions and vulnerability to disease contagions, in view of the dump's proximity.
7. Ojuri *et al*. (2018) Ondo - Nigeria	Assess the potential for rehabilitation and the level of risk of the Igbatoro dump, a waste dump managed by the State of Ondo - Nigeria	110	A total risk index of 571.58 was obtained for the Igbatoro landfill, indicating a moderate risk assessment. Questionnaires distributed to the surrounding residents also showed that 83.6% of respondents agreed that the current management of the landfill (dump) is poor, while 81.8% supported their rehabilitation. Therefore, reconstruction of the Igbatoro landfill to an acceptable and controlled condition is recommended.

In category I, studies show that the main social actors involved in the management of solid waste are the collectors of materials that can be reused, the so-called cooperatives of collectors of recyclable materials. These studies show the perception of waste pickers regarding the workload and the labor difficulties faced, the economic and social problems and the performance of some cooperatives. Other studies classified in this category included the analysis of the perception of professionals from educational institutions and health establishments regarding waste management and, finally, some articles had as their object the population that generated the waste and its role in its management. Category 1 studies have shown several problems in waste management and management in Brazil. The population's lack of environmental education and the lack of information regarding the methods of separation and disposal of waste generate deficiencies in the actions of reuse, recycling and treatment. The articles in this category also showed that there is, in general, no concern with reducing waste at source, not only with regard to households, but also with regard to services and health. Problems related to the collectors of reusable materials were also demonstrated, such as excessive workload, exposure to various occupational risks and lack of training and awareness to carry out the activity, in addition to excessive informality.

In the second category, which deals with studies on solid waste management tools, selective collection, recycling and reverse logistics were the most addressed topics. Other similar issues such as the management of Electronic Waste, the Waste Management Plans and the product life cycle are found. All the tools found in category II are directly related to the most addressed tools (selective collection, recycling and reverse logistics). These themes, in addition to being the ones that appear most in the selected articles, are interdependent, since one cannot have reverse logistics or efficient recycling without a well-operated and judicious selective collection. Through the category II studies, it was possible to observe that the Management or Waste Management Plans are scarce, outside the local reality or outdated. Management tools such as reverse logistics, life cycle assessment and new treatment technologies such as coprocessing, can help manage and generate value in the waste management chain and improve management practices, but are still underused. Selective collection and separation of waste at source are still inefficient and need greater dissemination and effectiveness, including with regard to electronic waste, although some consumers are concerned with the correct disposal of waste.

In the third and last category of studies on health issues related to solid waste, some results found show the relationship between direct or indirect contact with waste and health problems. The articles showed that a large part of the health problems caused by contact with waste affects waste pickers, workers in a public cleaning company. Exposures to biological and chemical agents are the most frequent risks in the activity of these workers. People who live in the vicinity of waste disposal areas, especially landfills, are also subject to health problems and realize that the poor environmental conditions in the surroundings cause harmful effects on their health and that of their families.

3 CONCLUSIONS

Through this review, it was possible to verify the importance of the qualitative approach through the knowledge produced in studies of this nature related to solid waste, since they can bring valuable contributions to their management. These studies show that part of the problems that involve solid waste management have no answers in numbers, especially because they involve human beings. Therefore, the importance of teaching the qualitative research method, originating in the area of Social and Human Sciences, in Graduate Programs in the area of Engineering is emphasized.

Finally, it is worth noting the limitations of this systematic review, because despite the use of the term qualitative research as a search descriptor of articles having presented a large recurrence, in several titles found the scope of the research was not qualitative. It can be assumed that the qualitative method has been used by authors who still do not have sufficient knowledge about it, resulting in its misuse. On the other hand, other qualitative studies may not have been included in this review because they were not identified by these descriptors.

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